

# **Impact of FY04 Budget on LBNL**

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# Future Programs in Berkeley



- Discuss to put '04 budget in perspective
- Yesterday described current program
- Elements behind choices in program direction:
  - Programs that carry high impact on science
  - Programs that have a unique Berkeley contribution
  - Cutting edge science
  - Synergy with current efforts for leverage into the future
- Physics from 'start to finish'

# Planning Assumptions: In 2007



- **ATLAS is preparing for first physics run**
- **LHC Accelerator Research Program (LARP) is nearing full scale R&D**
- **SNAP is into construction**
- **1 GeV laser accelerator facility running at LBNL**
- **Beginnings of the LC program**
- **Neutrino program continuing to evolve**
- **BaBar, CDF and D0 groups at LBNL ramping down**

**Our highest priorities in the longer term:**

- **Electroweak symmetry breaking (ATLAS, LARP, LC)**
- **Cosmology and Astrophysics (SN/SNAP, CMB)**
- **High field, Nb<sub>3</sub>Sn magnet development**
- **1 GeV, all optical accelerator laboratory (I'OASIS)**
- **We hope to maintain the breadth of our program with a joint effort (PD, NSD, AFRD) on neutrino physics**

# Long Term Issues – ATLAS/LARP



- Berkeley's critical roles in pixels/silicon tracking, core software and physics simulation/analysis will continue well beyond 1<sup>st</sup> collisions at the LHC.
- Increased physicist participation (senior, postdocs, students) essential to meet our construction, operation and analysis responsibilities and upgrade desires in both ATLAS and LHC accelerator.
- Core technical personnel at Berkeley must be retained to have any role in US ATLAS operations, upgrade R&D and upgrades to both hardware items and software, in which we are currently leaders.

**Main concern: Further erosion of the proton base program funding threatens our LHC effort.**

- Supercon is the world leader in establishing practicality of high field Nb<sub>3</sub>Sn magnets
  - Essential to any energy upgrade of LHC
  - Basis for a second generation IR for LHC
- U.S. Conductor Development program is essential to keep companies “in the business”
- Work of program is critical to future accelerator projects, particularly LHC

**Main Concern: Decaying infrastructure threatens program progress; DOE has responded to this in '04**

# Linear Collider



- **AFRD actively involved in designing damping ring complex**
  - **Requires continuing strength in theory and beam instrumentation & control**
- **Will help facilitate University involvement in Accelerator R&D**
- **Campus hire brings world leadership to the US LC program (Marco Battaglia)**

- **KamLAND gets us an early start with modest effort - collaboration with NSD builds on LBNL strengths**
- **Ice<sup>3</sup> will come later - again not a large effort**
- **Future directions and facilities depend on the outcome of on-going study group**



# World Leading Laser – Plasma Accelerator Program



- **Close linkage with SciDAC and NERSC theory and simulation efforts guides experimental developments**
- **LBNL infra-structure investment in L'OASIS will allow for the first 1 GeV, all optical accelerator science facility**
- **High rep-rate 1 GeV facility allows study of practicality of laser accelerators for HEP**

# Supernova/SNAP



- This is THE major new program at Berkeley Lab
- Technical progress thus far has been on track
- Ready and waiting for CDØ decision
- Will need to increase scientist participation locally to succeed on the project; transitioning by senior staff is happening (Roe, Kadel, Carithers)

**Next step: Arranging NASA involvement**

- **Building an effort in collaboration with Berkeley campus**
- **Major elements:**
  - hardware
  - theory
  - simulation
- **Partnership with NERSC/computing office seems natural**
- **Possibility of ‘cosmic simulator’ program?**

# Cosmic Simulator

The Cosmic Simulator is the concept of providing an integrated framework in which component simulations can be linked together to provide a coherent, end-to-end, history of the Cosmos.

## THE HISTORY AND FATE OF THE UNIVERSE

Eight major stages in the evolution of the universe are illustrated below.

The Big Bang occurred everywhere in the universe. Here one region has been illuminated and followed through time. The expansion is far greater than can be shown here.



# Base Program Budget – Physics Division



	<b>FY03</b>	<b>FY04</b>	<b>Change</b>
<b>Electrons</b>	<b>2000</b>	<b>2975</b>	<b>+975</b>
<b>Technology</b>	<b>2490</b>	<b>1188</b>	<b>-1302</b>
<b>Theory/PDG</b>	<b>2544</b>	<b>3100</b>	<b>+556</b>
<b>Protons</b>	<b>6694</b>	<b>5300</b>	<b>-1394</b>
<b>Non-Accelerator</b>	<b>5880</b>	<b>10806</b>	<b>+4926</b>

# Electrons & Technology Line Changes



- For FY03, BaBar computing and LC work in 'technology' line – moved to electron line for '04
- Net result – electrons about flat
- Technology down below flat ~300K – all 'blue sky' R&D terminated for FY04

# Theory/PDG Line Changes



- For FY04, increase by \$556K
- Replaces some of the PDG staffing losses during RIF last year; PDG effort being restructured
- Increase ensures health of PDG and theory in the years to come; DOE has responded to our request for help in this area.

# Proton Line Changes



- Sharp cut to protons is real
- Endanger ATLAS deliverables in pixels and strips
- Major impact on LBNL CDF & D0 efforts



# Impact of Proton Cuts on CDF High Pt Program at LBNL

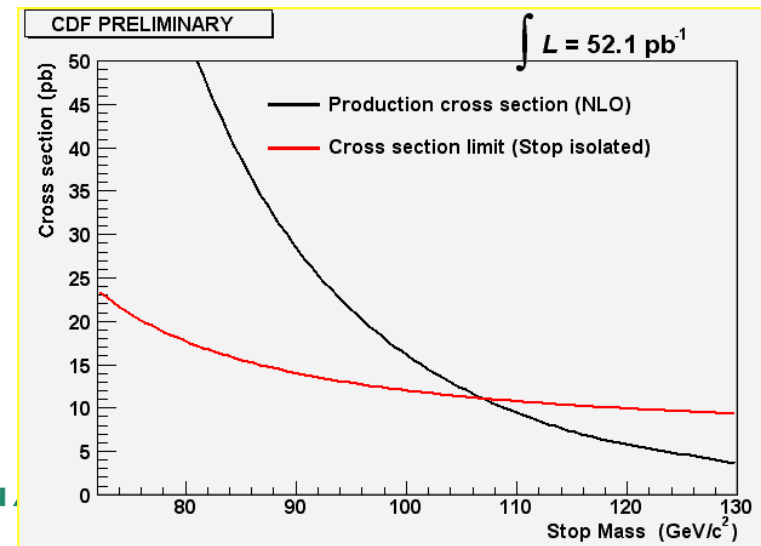
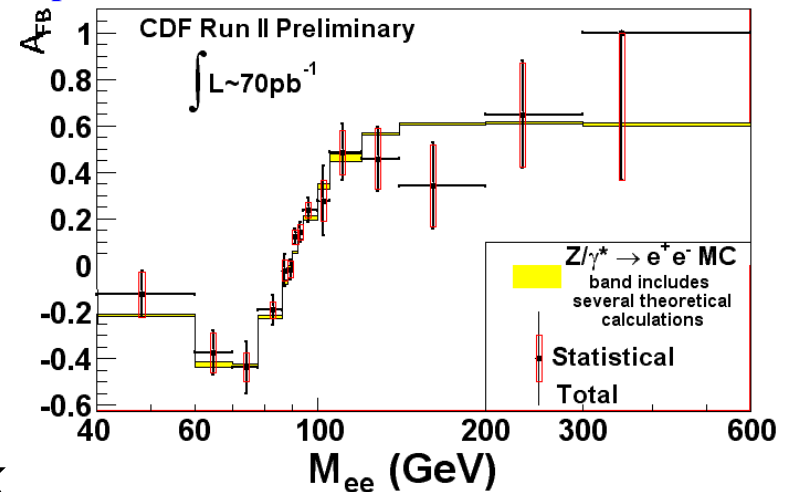


- Contributions to Z asymmetry
- Charged Massive Long-lived particles and SUSY search for stable stop quark.  $M > 107 \text{ GeV}$
- Precision electroweak measurements, top mass, beyond standard model searches
- Foundation for future ATLAS work
- We prefer physics from 'start to finish' – conception, design, fabrication, commissioning, operations, reco/simulation, analysis, optimization

Threatened by proton budget cuts

LAWRENCE BERKELEY NATION

The Forward-Backward Asymmetry of the  $Z/\gamma^*$  decay products is predicted by the standard model. Any deviation from prediction is indication of new physics.  
70  $\text{pb}^{-1}$  of Run II data used here



# Non-Accelerator Line Changes



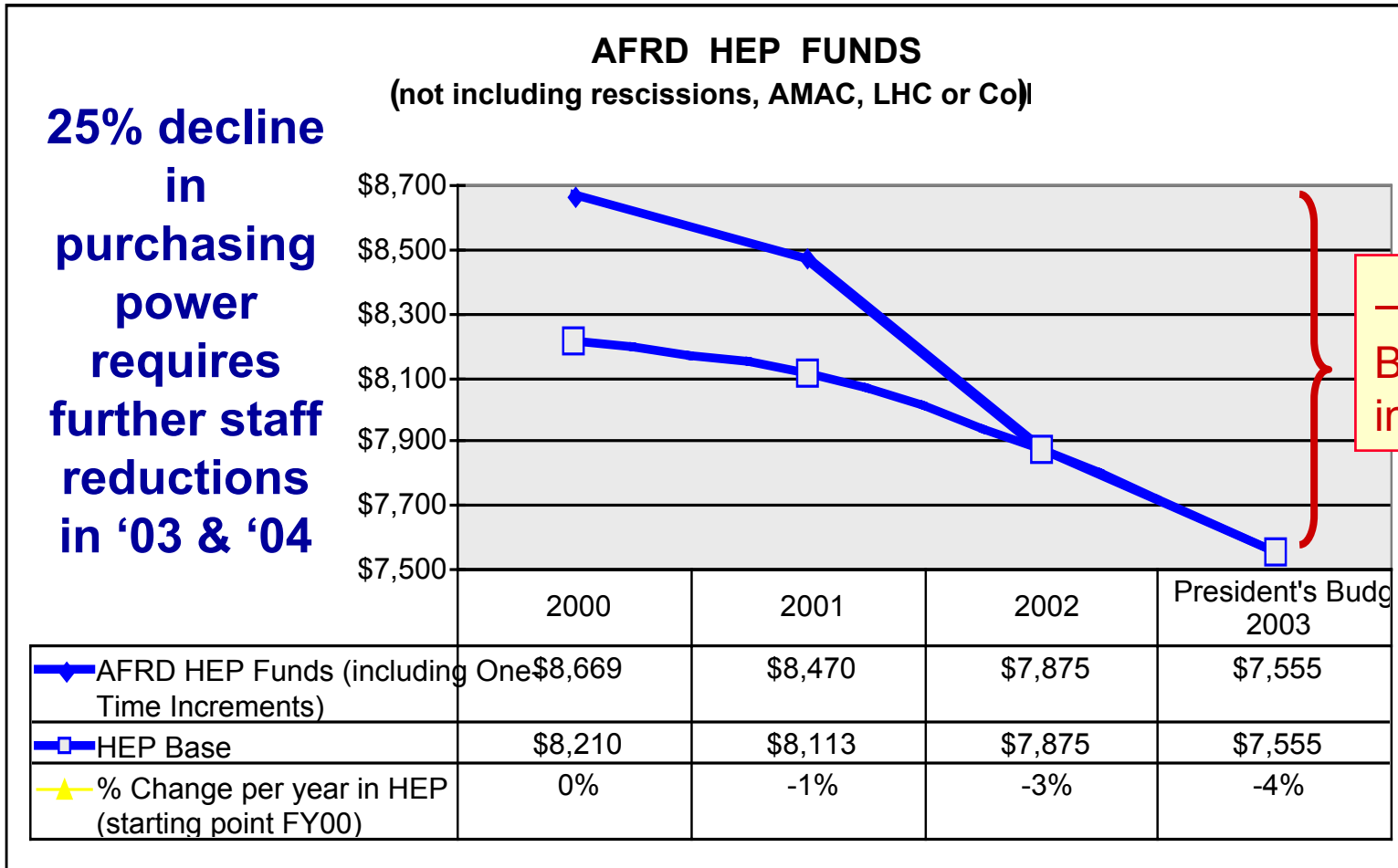
- Major increase to support SNAP R&D
- Moves us toward conceptual design and costing for community decision on the project
- Builds on top of an existing Berkeley base and generous Laboratory support; all of the increase spent outside the Physics Division
- Increase addresses our highest priority concerns in Physics Division program

# Base Program Budget Issues – AFRD



	<b>FY03</b>	<b>FY04</b>	<b>Change</b>
<b>CBP</b>	<b>3768</b>	<b>3763</b>	<b>-5</b>
<b>Accelerator Development (SC, conductor development)</b>	<b>3782</b>	<b>3812</b>	<b>+30</b>
<b>Accelerator Development (test facility)</b>	<b>0</b>	<b>500</b>	<b>+500</b>
<b>Muon Collider R&amp;D</b>	<b>280</b>	<b>280</b>	<b>0</b>

# Despite our Productivity, AFRD Support Continues to Decline



Increments for physics staff prior to FY03: “infrastructure funds” (‘00 and ‘01) , LHC accelerator physics (‘00, ‘01, ‘02), muon collaboration (‘00, ‘01, ‘02)

# **FY04 Base Program Issues – Center for Beam Physics**



- **Flat budgets will result in continuing manpower cuts (~ 2 FTE) in collider technology group (Beam Electrodynamics)**
  - All work relevant to future colliders will have to be from non-base sources
- **HEP will be unable to take advantage of “one-time” DOE/SC investment in world-leading L’Oasis facility to demonstrate >1 GeV laser accelerator**
  - Staff lost in FY02 & FY03 will not be replaced
- **Ability of SciDAC project to support “near-term” HEP needs lessened**
- **Major support from LBNL Directorate has kept us afloat**

# FY04 Base Program Issues – Supercon



- **Additional money for magnet test facility begins restoration of infrastructure for this crucial HEP resource**
  - Addresses our highest priority concern in AFRD program
  - Similar increment needed in FY05
  
- **Flat budget in operational program will result in reduced engineering and technical support (2FTE) and reduced student participation**
  - Slower large magnet development schedule
  - Reduce or eliminate testing of superconducting strand for HEP community

## Berkeley plays an essential role in the National Program

- ◆ LHC/ATLAS ◆ BaBar ◆ CDF ◆ SNAP ◆ Supercon ◆  
◆ SciDAC ◆ Linear Collider ◆ CMB ◆ I'OASIS ◆
- ❖ We collaborate extensively with universities in our program
- ❖ We are starting to reap physics benefits from our major hardware and management contributions over the last few years.
- ❖ Major support from LBNL's Directorate for CBP and SNAP development.